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# STUDIES IN SMALLPOX

AND

# SANITATION

Based on the experience of the  
City of Liverpool.

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## A REPLY TO THE BOOK

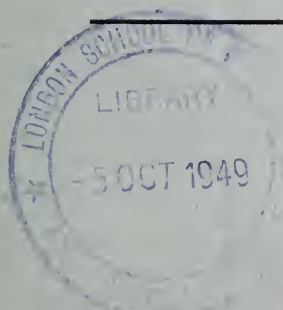
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“STUDIES IN SMALLPOX AND VACCINATION,”

BY

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## P R E F A C E .

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DR. HANNA states in the preface of his book (published in February, 1913), that his "studies on the subject of smallpox and its prophylaxis by vaccination have been the outcome of several years of observation of cases which have occurred in the City and Port of Liverpool," and he expresses the hope "that the book will appeal to Medical Officers of Health, Vaccination Officers,\* and those in charge of Infectious Disease Hospitals. In addition," he adds, "general practitioners may find it useful in furnishing illustrations of cases of smallpox. The work also contains useful and striking diagrams and arguments as to the value of vaccination and re-vaccination which may be used with parents and others who object to these preventive operations."

The book has been welcomed with a chorus of approbation in the columns of the Medical Press. The "Medical Times" (29th March) said, Dr. Hanna "has established his claim to be regarded as an authority on smallpox and the value of vaccination as a prophylactic measure. Those who have to deal with epidemics of this truly terrible scourge should study this delightful contribution to its literature." The "Lancet" (3rd May) devoted a leading article to "Dr. Hanna's little book," which closed by stating that it would "perhaps be in special demand by medical officers of health and public vaccinators, but it may cordially be recommended to a wider public." The "Hospital" (2nd August) said, "this monograph is indeed an object-lesson for the doubters and the 'anti's,' and it would be extremely interesting to watch any attempt by the anti-vaccination societies to get round Dr. Hanna's observations." "The Midland Medical Journal" (September, 1913), in the course of a paragraph commenting on Dr. Hanna's book, and also on the Seventeenth Annual Report of the National Anti-Vaccination League, said "it is probably too much to expect this book to convince the confirmed 'anti'; but if he will only read it we anticipate considerable modification in some of the statements which will appear in the next annual report. In the meantime we borrow (with acknowledgments) the closing sentence of this year's report: 'Truth must win, and Truth is on our side!'"

The "Medical Press" (19th November, 1913) closed a review of the book by saying, "We believe that it is a book that should be studied by every practitioner who wishes to take his part in

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\* Dr. Hanna apparently means "Public Vaccinators."

educating the public in the fight against disease. Armed with the information that this book contains, the practitioner will be able to meet the fallacies of the faddist, to state the facts in their true perspective, and help to knowledge those whom ignorance makes an easy prey to the anti-vaccinator. To Dr. Hanna for his work, and to his publisher for the way the book is turned out, we tender our sincere thanks."

There are signs that Dr. Hanna's book is likely to play a prominent part in the vaccination controversy. In the debate in the Manx Legislative Council in April, 1913, which ended in the rejection of a Bill to allow conscientious objection to vaccination in the Isle of Man, the Clerk of the Rolls based his opposition to the Bill almost entirely upon Dr. Hanna's book. It is beginning to be quoted also by Medical Officers of Health in all parts of the world, and will no doubt be widely referred to in their future annual reports.

As the book is a confessedly *ex parte* compilation, it behoves those who really wish to study the question from every point of view, to be fair enough to read the anti-vaccinist side of the case as presented in this brief rejoinder.

Dr. Hanna has approached the subject solely from the standpoint of vaccination, and has even narrowed that limited standpoint to a statistical study, based upon records made in smallpox hospitals, of 1,163 cases of smallpox occurring since 1902. Vaccination has been zealously practised in Liverpool, with little opposition, for over a century. On the 1st April, 1807, the Town Council presented Dr. Jenner with the freedom of the City, and in no town in England have the authorities met with less opposition to the enforcement of the Vaccination Acts. Dr. Hanna ignores this long and faithful devotion to the Jennerian rite and its relation to the pre-1902 smallpox epidemics. Why?

In former times Liverpool was one of the most overcrowded and insanitary cities in the United Kingdom. In the forties, fifties, and sixties of last century, it was seldom free from terrible epidemics of typhus, cholera, smallpox and other zymotic diseases. Its sanitary history provides unique data for a real study of the problem of smallpox. Dr. Hanna has, however, entirely ignored these data. Why?

Some day the problem of smallpox in Liverpool will be approached by its Health officials from the standpoint of sanitation alone. When that day arrives, the experience of Liverpool, as briefly outlined in these pages, will be officially set forth as providing irrefutable proof that smallpox is a product of insanitation, and that its eradication, so long retarded by a doting reliance upon vaccination, will only be eventually secured by the universal adoption of personal and municipal cleanliness.



*“He who knows only his own side of the case, knows little of that.”*—JOHN STUART MILL.

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## **THE SANITARY HISTORY OF LIVERPOOL: A Thumb-nail Sketch.**

In addition to being noted as one of the greatest cities of the British Empire, and one of the principal ports of the world, Liverpool has possessed, until recent years, the unenviable distinction of being one of the most overcrowded and unhealthy cities in the United Kingdom ; and this despite the fact that the sanitary advantages of its physical situation are unrivalled.

Various causes have tended to produce this evil reputation of “the black spot on the Mersey.” Not the least of the prime causes was the phenomenal growth of the City at a time when sanitary science was little known and less regarded. Reckoning from the beginning of the eighteenth century, when the town was but a small fishing village, to the middle of the nineteenth, the population

increased no less than sixty-fold. During the second thirty years of the nineteenth century alone the figures were more than doubled. Another such cause has been its large floating population, and still larger population of dock and other labourers, porters, etc., dependent upon the more or less ill-paid and casual employment offered by the shipping trade of the port, and requiring to be cheaply housed close to their work. The endeavour to cope with this requirement led to the erection of large numbers of back-to-back court-houses, with separate cellar dwellings of two rooms underneath, and without adequate water supply or sanitary conveniences. The builders were apparently left free to build as they pleased, so far at least as sanitary science was concerned. The result of these staggering violations of hygienic living may be summed up in a sentence—in 1844 the then Medical Officer of Health reported that Liverpool was the most unhealthy city in the Kingdom.

In addition to these general causes of the phenomenal amount of sickness prevalent in Liverpool in the early part of the nineteenth century, there were also certain special causes. In 1847 there was an enormous immigration of Irish poor into the city, consequent upon the potato famine and other troubles in the sister isle. These destitute folk swarmed into the already overcrowded lodging houses, back-to-back courts, alleys, and cellar dwellings of the slums. "In more than one instance," says Dr. Hope, "upwards of forty were found sleeping in a cellar. Then occurred the severest epidemic visitations of which any record remains. Fever, dysentery, and smallpox made their appearance in these crowded quarters, and fever spread with amazing rapidity, thousands of patients being under treatment by the dispensary and parish medical officers, cases being so numerous as to completely baffle the attempts of the parish authorities to deal with them. Hospital after hospital was opened in different districts of the town . . . In one street, Lace Street, no less than 472 persons died from it and other causes during the year, being one-third of the entire population of the street."† The total deaths in the city during the year 1847 reached 21,129, representing a death-rate of 63.5 per 1,000 for the whole city! Of these deaths 381 were due to smallpox, 2,589 to diarrhoea, and dysentery, and 5,845 to "fever."

In 1849 a terrible cholera epidemic was introduced by emigrants passing through the City on their way to America, 7,000 deaths being ascribed to this and allied diseases.

In 1859 and 1860 there was a welcome lull, the general death-rate falling to 26.0 and 25.7 respectively, the lowest rates up to those years within the period of authentic records.

The cessation of hostilities on the part of the dread reaper seems, however, to have arisen rather from sheer exhaustion than from any solid improvements in the City's health conditions.

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† Dr. Hope's Annual Report for 1905, "Retrospect," p. xv.

In 1863, when the population had risen to about 450,000, about 112,000 persons, or nearly one-fourth of the whole population, were housed in 3,175 courts in the central wards of the City, containing 18,610 insanitary back-to-back houses, and the compression of the population in some of the worst of these courts nearly averaged 1,000 persons to an acre. In 1866, 340,000 people, or more than two-thirds of the whole population, lived in houses with a rental below £13 per annum.

Such have been some of the sanitary problems which have confronted, and still in part confront, the Health Authorities of Liverpool, and in the solution of which they have worked zealously, as soon, and as far, as the problems were recognised as demanding a solution.

### THE FIRST "SANITARY" ACT OF PARLIAMENT.

As evidence of this sanitary spirit it may be mentioned that when the era of sanitary legislation began to dawn, some seventy years ago, Liverpool was the first town to set a good example. In 1842 a local act was passed "for the promotion of the health of the inhabitants," and "the better regulation of buildings." Later, its "Sanitary Act, 1846," (the first "Sanitary" Act passed by Parliament), prepared the way in many respects for the first Public Health Act of 1848, which was subsequently enacted in the interests of the country at large. A little later (1864) another very important local Act was obtained, enabling the Municipality to deal with insanitary property. In fact "no town in the Kingdom possesses such extensive powers for dealing with this class of property, as are possessed by Liverpool." When that Act was passed there were 22,000 insanitary houses in the Liverpool slums. The greater portion of these houses have since been demolished by the Corporation or pulled down for trade, etc., purposes. At the end of 1911 there remained to be dealt with about 3,000. Besides pulling down insanitary property the Corporation have also erected a large number of dwellings. The total cost of the work of demolition and housing up to the end of 1911 amounted to about £1,100,000.

Space forbids any reference to other aspects of Liverpool's sanitary progress, such as the establishment by the Municipality of its present abundant water supply, the substitution of water closets for privies, its public baths and washhouses, its public parks and open spaces, its fever hospitals, its model dwellings for the working classes, its electric trams and lighting, and last, but not least, the manifold activities of its Public Health Department, so ably controlled for many years past by Dr. E. W. Hope, the present Medical Officer of Health. Nevertheless, even this far too brief recital of the more important phases of Liverpool's sanitary history will, it is believed, suffice to bring into prominence the marked

influence which the activity of the authorities has had in relation to the incidence of smallpox and other zymotic diseases.

### SMALLPOX IN LIVERPOOL.

Perhaps the most concise way of setting forth the recorded history of smallpox in Liverpool will be by means of a short series of tables.

The first table is one which was constructed by Dr. Farr, of the Registrar General's Department, in 1875, for the purpose of illustrating the effect which healthy environment had upon zymotic diseases generally. The point to be noted here, however, is that Dr. Farr awarded Liverpool the doubtful honour of being the "awful example" of the effect of an unhealthy environment. His figures shewed that :—

TABLE I.

For every million born alive there would die according to the life tables :—

	In Healthy Districts	In England	In Liverpool
By Smallpox .. ..	2,359	6,521	8,141
By Fevers (Typhus, &c.) ..	28,146	38,107	76,563
By Measles .. ..	6,912	12,865	26,973
By Whooping Cough .. ..	10,234	15,161	34,021
By Scarlatina .. ..	21,403	30,021	38,302
Total .. ..	69,054	102,675	184,000

Dr. Farr, commenting on these remarkable figures, stated his opinion. "that healthy sanitary condition as to food, drink, and cleanliness of person, house and city, stands first in importance; after it, but subordinately, come quarantine, vaccination, and other preventives, as means of subduing mortality; for the mere exclusion of one out of many diseases appears to be taken advantage of by those other diseases, just as the extirpation of one weed makes way for other kinds of weeds in a foul garden."

Some portion of the enormous disparity between Liverpool and healthy districts, as shewn by Dr. Farr's figures, may be attributed to the denser population of the former affording greater opportunities for infection. The following Table II. shows, however, that this portion can only be slight as, since Dr. Farr's tables were prepared, the diseases in question have declined out of all proportion to any change in the average density of population.



TABLE II.

Table showing the annual average death-rate in Liverpool from the principal zymotic diseases, etc., per 100,000 of the population.

Period .. .. .	1856-65	1866-75	1876-85	1886-95	1896-1905	Per cent. of decline in the last decade as compared with the first.
Population average..	443,938	493,405	533,651	536,974	691,351	
Density per Acre ..	92	105	116	120	50	
Scarlet Fever ..	135.0	159.9	78.1	47.9	29.1	78.4
Typhus Fever ..	168.5	132.2	44.1	6.9	3.6	98.0
Typhoid Fever..	Records not available		21.5	28.4	19.3	—
Measles ..	72.4	86.2	96.1	74.3	47.5	34.7
Whooping Cough	107.6	100.6	87.6	60.0	47.7	56.0
Smallpox ..	37.6	48.1	16.8	1.6†	2.8	92.5
Phthisis ..	350.7	333.9	255.3	212.9	182.7	48.0
All Causes ..	3,100.0	3,070.0	2,700.0	2,530.0	2,177.0	30.0

† The first Municipal Smallpox Hospital was opened in September, 1884.

(NOTE.—The city boundaries were extended in 1895, and the area of the city trebled, by the incorporation of adjacent suburban and rural districts. The density of the pre-1895 city area, which contains about three-quarters of the total population, is more than double that for the city at large, and seven times greater than that of the added areas.—See Col. 3, Table V., p. 14).

## TYPHUS AND SMALLPOX DECLINE TOGETHER.

The first two decades included in the above table may be fairly regarded as typical of the state of things which existed in Liverpool prior to the effective introduction of the sanitary reforms already referred to; and, as will be seen, the subsequent decades reveal the results of those reforms in a most striking fashion. It will be specially noted also that the marked decline of smallpox and typhus has taken place *pari passu*; a fact which certainly tends to prove that the two diseases have shewn themselves to be equally amenable to the same remedial influences.

This simple fact is, however, denied by pro-vaccinists. They contend that while the sanitary development of Liverpool has eradicated typhus, and enormously reduced the zymotic class of diseases generally, it has been powerless to influence smallpox, and that the decline of that disease has been solely due to the influence of vaccination. In a report to the Liverpool Health Committee, dated 31st December, 1903, on the subject of the smallpox epidemic then just over, Dr. Hope, the Medical Officer of Health, said:—

“the freedom of a community from smallpox is associated with the extent and efficiency with which vaccination has been practised” (p. 4).

“those who are efficiently vaccinated are as safe as Hospital Nurses. It is only those who are imperfectly protected who are liable to contract the disease at all (p. 4).”

“evidence is conclusive that ‘social condition’ is of no consequence provided that the exposure is the same. The determining factor in all

cases is the 'vaccination.' The incidence of the disease is entirely different from the incidence say of typhus fever, which is essentially with slum property and the most insanitary conditions in the city." (P. 6).

It is not easy to understand how Dr. Hope came to make these statements, because they are directly opposed to the facts revealed by the history of smallpox in Liverpool. That history shows that the incidence of the disease has always been practically the same as that of typhus. This would be seen at a glance, if a table could be prepared for these two diseases alone, showing their yearly prevalence and mortality in each ward of the City.

### THE CAUSE OF THE COMMON FALL OF TYPHUS AND SMALLPOX.

In his Annual Report for 1905, Dr. Hope inserted a "Retrospect" of the sanitary history of the City, from which a quotation has already been made. In this "Retrospect" he says:—

"The year 1883 witnessed practically the extinction, at all events in epidemic prevalence, of typhus fever. It was fully realised by this time that the only way of effectually checking the disease, which in 1882 and 1883 had caused 593 and 540 deaths, respectively, was to adopt means to isolate in hospital those who were infected by it at the earliest possible moment. To accomplish this end, two things were essential; first, it was necessary that hospital accommodation should be available; and, secondly, administrative methods should be improved so as to ensure immediate discovery of the sick persons or the infected persons, and to cause their removal."

The steps indicated, viz.: prompt notification and isolation of all cases of typhus, were accordingly initiated in 1884. Although it is not clearly brought out in Dr. Hope's "Retrospect," it is nevertheless a fact that precisely the same steps were also adopted in the case of smallpox, and with substantially the same results. This is shown by the following figures:—

TABLE III.  
CITY OF LIVERPOOL.  
Deaths from Typhus and Smallpox.

	During the 37 years 1848-84		During the 25 years 1885-1909		Per cent. of Decline.
	Total No.	Average per ann.	Total No.	Average per ann.	
TYPHUS ..	19,464	526	738	29.5	94.0
SMALLPOX ..	5,906	160	330	13.2	91.7

A consideration of the various smallpox epidemics which have occurred in Liverpool since 1871 (so far as the data are available) also provides convincing evidence that vaccination cannot have exercised any beneficial influence whatever in the diminution in the prevalence and severity of that disease.

The following table furnishes an interesting comparison of the experience of Liverpool in the last five epidemics:

TABLE IV.

## LIVERPOOL SMALLPOX EPIDEMICS.

Epidemic.	Alleged Unvaccinated.			Doubtfully Vaccinated.			Admittedly Vaccinated.			Total.		
	Cases.	Deaths.	Mortality Per cent.	Cases.	Deaths.	Mortality Per cent.	Cases.	Deaths.	Mortality Per cent.	Cases.	Deaths.	Mortality Per cent.
(a) 1871 ..	264	148	56.0	168	96	57.1	1184	131	11.0	1616	375	23.2
% of total	16.3	39.5	—	10.4	25.6	—	73.3	34.9	—	—	—	—
(b) 1876-7 ..	218	100	45.9	72	13	18.1	731	45	6.3	1021	158	15.4
% of total	21.3	63.3	—	7.1	8.2	—	71.6	28.5	—	—	—	—
(c) 1884-5-6	139	61	43.9	38	10	26.3	658	26	4.0	835	97	11.6
% of total	16.6	62.9	—	4.6	10.3	—	78.8	26.8	—	—	—	—
(d) 1892-3 ..	19	8	42.1	3	2	66.0	147	4	2.7	169	14	8.3
% of total	11.2	57.2	—	1.8	14.3	—	87.0	28.5	—	—	—	—
(e) 1902-3 ..	291	72	24.7	135	29	21.5	1634	50	3.0	2060	151	7.3
% of total	14.1	47.7	—	6.6	19.2	—	79.3	33.1	—	—	—	—
Total ..	931	389	41.7	416	150	36.0	4354	256	5.8	5701	795	13.9
% of total	16.3	48.9	—	7.3	18.9	—	76.4	32.2	—	—	—	—

(a) There were 1919 deaths in the 1871 Epidemic over the whole city. The above figures relate only to the cases treated in the Liverpool Workhouse Hospital serving the poorest part of the City. It is very probable that only severe cases were taken to the Hospital. The figures are taken from Dr. Coupland's Report to the Royal Commission on the Liverpool Epidemic of 1892-3.

(b) During the years 1876-7 there were 685 deaths from smallpox in the city as a whole. The above figures (which are also taken from Dr. Coupland's Report) only refer to the cases treated in the West Derby Union Workhouse Hospital.

(c) These were the first cases to be treated in the first Municipal Smallpox Hospital, which was opened in September, 1884. Dr. Hope was then the Resident Physician, and the figures are taken from one of his reports.

(d) These figures are taken from Dr. Coupland's Report to the Royal Commission on the 1892-3 Epidemic.

(e) These figures are taken from Dr. Hope's Report of the 31st December, 1903.

A little study of this table leads to interesting conclusions. Some of its figures, as, for example, the large proportion of deaths, and the large fatality rate amongst the alleged unvaccinated cases, seem to tell strongly in favour of vaccination. A little consideration will show that that conclusion should not be hastily assumed. In the earlier epidemics the cases would doubtless not be removed to hospital until the rash had well developed, when any vaccination marks that might be present would be invisible. Moreover, the "unvaccinated" section would include the vast majority of infants under six months, who are not required by law to be vaccinated, children whose vaccination had been postponed on account of ill-health, and children of nomadic slum-dwellers whose migratory habits make it almost impossible for the vaccination officers to bring them within the meshes of the law. **The great point to be borne in mind is, that the vaccinal condition of Liverpool was as perfect in the first epidemic as it was in the last.**

### LIVERPOOL—A WELL-VACCINATED CITY.

The records of the Local Government Board, which begin with the year 1872, show that, until recent years, from 80 to 85 per cent. of the births have been annually vaccinated, with little or no opposition on the part of parents.\* There is reason to believe also that in the early period of compulsory vaccination, viz.: from 1853 to 1871, Liverpool was one of the best vaccinated cities in the United Kingdom. (*Vide* Dr. Seaton's evidence before the House of Commons Select Committee on the Vaccination Act, 1867, which sat in 1871). That this must have been so, is apparent from the high percentage (73.3) of admittedly vaccinated cases which were recorded in the Liverpool Workhouse in 1871. The great probability is that this percentage does not favour the anti-vaccination side. The admitted percentages of vaccinated cases in the subsequent epidemics (viz.: 71.6, 78.8, 87.0 and 79.3) also afford striking proof of the thoroughly well-vaccinated condition of the citizens of Liverpool, and also of the thoroughly futile character of the "protection" afforded in these cases.

The uselessness of that "protection" is, however, more completely revealed by a study of the experience of Liverpool in the 1902-3 epidemic, the epidemic which provided Dr. Hanna with the major part of the cases referred to in his book.

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\* In his Annual Report for 1885, the then Medical Officer of Health (Dr. J. Stopford Taylor), estimated "that 92 per cent. of the people of Liverpool had been more or less efficiently vaccinated." Twelve years later his successor, the present holder of the office (Dr. E. W. Hope), said that "there were grounds for supposing that Liverpool was amongst the best vaccinated communities in the Kingdom." In 1909 the "Lancet" (16th October) said "The anti-vaccination movement in Liverpool does not appear to find much favour with the sensible inhabitants of the city."



## THE 1902-3 EPIDEMIC.

Liverpool, in common with most other large towns, was visited by a comparatively serious outbreak of smallpox during the years 1902-3. From the report issued by Dr. Hope, the Medical Officer of Health, on the 30th December, 1903, it would appear that the cases reached the large total of 2,060, with 151 deaths, or 287 and 21, respectively, per 100,000 of the population. The epidemic was in fact more severe than any which had occurred since the years 1876-7, when there were over 3,000 cases and nearly 700 deaths. Under these circumstances it may well be asked, "If the sanitary improvements already mentioned have had such a marked influence in effecting the reduction of smallpox shewn in Table II., how is it that the like influences were not adequate to prevent the 1902-3 outbreak from assuming such extensive proportions?" This question involves the larger problem as to why smallpox is more or less quiescent at one time, and violently epidemic at another, and as the scientific experts who are investigating that question have not yet succeeded in offering a satisfactory solution, it will scarcely be expected that the problem should be attacked here. In the absence of any more satisfactory explanation, it may, however, be pointed out that, although the Liverpool authorities have done so much in strengthening their sanitary defences, there were at the time of this epidemic, and are still, numerous admittedly insanitary houses waiting demolition, many of which are dangerously overcrowded, partly in consequence of the dehousing which has already taken place. The abatement of the shocking congestion which formerly existed in the older wards has, moreover, had the unintended effect of increasing the congestion in the less insanitary-housed wards immediately adjoining. In this connection it may be mentioned that the density in one of the last named Wards (Netherfield Ward, in the Everton district, which contained a population of 33,374) stood in 1901 at the exceedingly high figure of 250 per acre; and it certainly seems more than a coincidence that it was in this ward that the 1902-3 outbreak first assumed epidemic proportions.

## SMALLPOX AND OVERCROWDING.

That the excessive severity of the 1902-3 outbreak was in some measure due to this aggravation of the evil of overcrowding in certain of the old parts of the city, is further confirmed by the following table, which shows that the incidence of cases was in almost exact ratio to the congested and generally insanitary condition of the areas affected:—

TABLE V.

## THE LIVERPOOL SMALLPOX EPIDEMIC, 1902-3.

District. (1)	Population 1901 Census (2)	Density per Acre (3)	Total cases of Smallpox 1902-3 (4)	No. per 1000 of the Population (5)	Zymotic Death Rate 1902. (6)	General Death Rate 1902. (7)
Exchange ( <i>a</i> ) ..	41,999	89	232	5.5	5.2	34.6
Scotland ( <i>b</i> ) ..	52,966	135	294	5.5	5.7	33.0
Toxteth ( <i>c</i> ) ..	106,043	122	439	4.1	3.6	22.9
Everton ( <i>d</i> ) ..	121,469	175	461	3.8	3.7	22.2
Abercromby ( <i>e</i> ) ..	52,440	77	132	2.5	2.5	22.2
Kirkdale ( <i>f</i> ) ..	69,386	98	181	2.6	3.6	21.4
West Derby, W. ( <i>g</i> )	86,694	128	159	1.8	2.6	19.7
OLD CITY ..	530,997	118	1,898	3.6	3.7	24.8
Walton ( <i>h</i> ) ..	54,615	28	170	3.1	2.9	15.7
West Derby, E. ( <i>h</i> )	43,856	15	65	1.5	1.9	16.0
Sefton Park ( <i>h</i> ) ..	30,187	23	32	1.0	1.8	12.6
Wavertree ( <i>h</i> ) ..	25,303	14	27	1.0	2.0	14.6
Garston ( <i>h</i> ) ..	17,289	10	10	.6	2.0	15.5
ADDED AREAS	171,250	17	304	1.8	2.3	15.0
WHOLE CITY ..	702,247	49	2,202*	3.1	3.3	21.6

\* This figure includes all the cases which occurred during the whole of the years 1902 and 1903. The total number for the epidemic proper was 2,060.

(*a*) The oldest district of the city. The density figures shown should be nearly doubled, as about one-half of the area is now occupied by offices, works, etc.

(*b*) The Irish District, represented in Parliament by Mr. T. P. O'Connor, contains much insanitary property.

(*c*) A labouring-class district with much insanitary property.

(*d*) A working-class district with considerable poor property in parts. Density increased of late years in consequence of demolition of insanitary property in older adjoining districts (*a*) and (*b*).

(*e*) A better-class residential district. The "West End" of old Liverpool, but has much poor property in parts.

(*f*) A working-class district (artisans) with some poor property in parts.

(*g*) A middle-class and working-class district.

(*h*) Suburban, semi-rural, and rural districts, with some poor property in parts.

It is submitted that the foregoing table presents a conclusive confirmation of the larger experience outlined in Table II. It again shows (cols. 5 and 6) that the incidence of smallpox restringedly follows that of the greater zymotic class, thus indicating that the causes which dominate the larger mortality also dominate the lesser, and that, as a consequence, the only real remedies for

the eradication of any of these diseases are to be sought in the patient and persevering application of the sanitary reforms which have already produced such wholly encouraging results.

It is significant that, although Dr. Hanna has all the figures at hand, he makes no attempt whatever in his book to institute a comparison of the incidence of smallpox in the respective districts of the City of Liverpool such as that made in the foregoing Table V. Even more significant is the fact that he makes no attempt to compare the incidence of the disease in the respective districts with the official figures, which he also has at hand, in regard to the percentage of infants vaccinated from year to year under the Vaccination Acts. His omission to do this is possibly accounted for by the nature of the records as shewn in the following table, which gives the latest information published in the Local Government Board reports, in regard to the vaccination of infants, etc., in the three Poor-law Unions having jurisdiction within the area of the City of Liverpool.

TABLE VI.

## AVERAGE ANNUAL PERCENTAGE OF BIRTHS.

(a) Successfully vaccinated.

(b) Exempted under the Conscience Clause ; and

(c) Not finally accounted for.

Period.	In the Parish of Liverpool.*			In the West Derby Union.			In the Toxteth Park Union.		
	(a)	(b)	(c)	(a)	(b)	(c)	(a)	(b)	(c)
1893-1897	82.5	—	4.1	81.6	—	7.2	75.4	—	12.0
1898 ..	81.3	0.1	5.3	78.1	0.2	9.5	67.7	0.4	18.8
1899-1906	82.1	0.0	4.3	79.9	0.1	8.4	75.5	0.1	11.7
1907 ..	84.4	0.2	3.7	78.0	0.7	11.6	75.2	0.8	13.4
1908 ..	85.4	0.4	3.2	77.2	1.8	12.0	73.3	1.5	14.4
1909 ..	85.0	0.7	3.0	76.4	2.6	12.5	73.0	2.7	13.7

\* On page 9 of his book, Dr. Hanna erroneously refers to the vaccinal condition of the *Parish* of Liverpool as applying to the whole City.

The number of births in the year 1909 in each of these Unions was as follows :—

Parish of Liverpool	..	..	..	4,948
West Derby Union	..	..	..	18,366
Toxteth Park Union	..	..	..	3,981
Total	..	..	..	27,295

The utter absence of any connection between vaccinal condition

and smallpox incidence will be apparent on comparing Table V. with Table VI. To make this comparison, it is necessary to note that the districts in Table V. are situated in the following Unions :

Exchange	}	in the Parish of Liverpool.
Scotland		
Abercromby		

Toxteth                      in the Toxteth Union.

Everton	}	in the West Derby Union.
Kirkdale		
West Derby, W.		
Walton		
West Derby, E.		
Sefton Park		
Wavertree		
Garston		

Had it been the case, as stated by Dr. Hope, that "the freedom of a community from smallpox is associated with the extent and efficiency with which vaccination has been practised," we should have expected to find that the Parish of Liverpool (which it will be seen is the best-vaccinated district of the City) would have suffered the least from smallpox. **Instead of that being the case, Table V. shows that it suffered the most.**

## A CONTROL EXPERIMENT.

The utter indifference of smallpox to vaccination may, however, be more completely displayed by a comparison of Liverpool's experience with that of Leicester during the same epidemic, a comparison which pro-vaccinists carefully avoid. If it be a fact that smallpox discriminates between "vaccinated" and "unvaccinated" in smallpox hospitals, in the manner shown by figures compiled by pro-vaccinist medical men within the secluded precincts of those establishments, it ought to follow, with arithmetical precision, that an exactly similar discrimination should be demonstrable as between well-vaccinated and badly-vaccinated towns when compared as a whole. The part cannot well be greater than the whole. It is easy to show, however, that no such result does follow, and that, therefore, the hospital discrimination is inevitably fallacious. Proof of these statements is afforded by the following :—



TABLE VII.

## SMALLPOX IN LIVERPOOL AND LEICESTER.

(NOTE.—The Liverpool epidemic lasted from October, 1902, to October, 1903. Leicester had two outbreaks, the first lasted from the end of December, 1902, to December, 1903, and the second from January to August, 1904.)

		LIVERPOOL.		LEICESTER.	
		No.	Per cent of Total.	No.	Per cent. of Total.
Vaccinated	Cases	1634	79.3	321	44.9
	Deaths	50	33.1	5	20.0
	Fatality	3.06	—	1.55	—
Unsuccessfully Vaccinated	Cases	45	2.2	—	—
	Deaths	7	4.6	—	—
	Fatality	15.5	—	—	—
Vaccination Doubtful	Cases	68	3.3	4	.6
	Deaths	19	12.6	1	4.0
	Fatality	27.9	—	25.0	—
No statement	Cases	22	1.1	—	—
	Deaths	3	2.0	—	—
	Fatality	13.6	—	—	—
Unvaccinated	Cases	291	14.1	390	54.5
	Deaths	72	47.7	19	76.0
	Fatality	24.7	—	4.9	—
TOTAL	Cases	2060	—	715	—
	Deaths	151	—	25	—
	Fatality	7.3	—	3.5	—
No. per 100,000 of Population	Cases	287	—	322	—
	Deaths	21	—	11.5	—
	% of Pop. more or less unvaccinated	10.0	—	90.0	—

Two very interesting results are revealed by this table:—

(1) In the first place it will be noted that, although the two outbreaks in Leicester lasted eight months longer than the outbreak in Liverpool, the number of cases per 100,000 of the largely “unprotected” population of Leicester was very little greater than the number recorded in “well-protected” Liverpool, thus indicating that, notwithstanding the terribly “unprotected” state of Leicester’s population, the disease did not “spread like wildfire,” as had previously been prognosticated.

(2) Instead of the cases attacked having suffered more seriously in Leicester than in Liverpool, as they ought certainly to have done if there is anything at all in the alleged mitigating effects of vaccination, there is a considerable difference in favour of the “unprotected” town. In short, it was much safer, so far as the risk of death was concerned, to be treated in the Leicester smallpox

Hospital, amid all its "inflammable material," than to be treated in the Liverpool smallpox Hospital along with its 80 per cent. of mitigated cases.

These results, no doubt, explain why Dr. Hanna and other pro-vaccinists take care never to compare the experience of well-vaccinated towns, as a whole, with that of ill-vaccinated towns.

### DR. HANNA'S BOOK.

Some may think it curious that this "Reply" to Dr. Hanna's book has so far had little to say directly about that book. The observant reader will, however, have noted that the arguments advanced have been flank attacks on Dr. Hanna's position, showing (a) that the diminution of smallpox in Liverpool during recent years has been due to the same sanitary and administrative causes which have produced a similar diminution of typhus and other zymotic diseases, and (b) that as the practice of vaccination has been a uniform and constant factor, at least from 1871 onwards, it cannot be reasonably credited with any share in the subsequent decline of smallpox.

It only remains now to deal with the remnants of Dr. Hanna's position by a frontal attack upon the arguments put forward in his book.

### DR. HANNA'S INTRODUCTION.

In the first paragraph of his Introduction Dr. Hanna briefly comments on the severity of eighteenth century smallpox. "In London," he says, "it was constantly present, and the deaths averaged, during the period 1761-1796, from 3,000 to 15,000 yearly; indeed, in the latter half of the century, the deaths seldom fell below 1,000." There is a serious inaccuracy in these figures. The highest number of deaths in any year during the period in question was 3,992 in 1772, and the lowest 636 in 1782. The average for the whole period was 2,090. Perhaps Dr. Hanna's figures were intended to read "3,000 to 1,500." Anyway they are wrong.

He then states with question-begging brevity, that "the decrease in smallpox prevalence since the beginning of the nineteenth century, and the marked reduction in its fatality, have been shown to be due to the protection afforded by the process of vaccination." The best way of meeting a statement of this kind, put forward as it is without a scrap of evidence or argument in its support, is to oppose it with one as brief, but susceptible of proof, viz.: The decrease in smallpox prevalence since the beginning of the nineteenth century, and the marked reduction in its fatality, have been shown to be due, in the early part of the century, to the abandonment of the practice of inoculating the disease of smallpox itself, in the

latter part of the century, to the notification of cases and their isolation in smallpox hospitals; and also to general sanitary improvements.

In his second paragraph Dr. Hanna alludes to the controversy which has arisen as to the value of vaccination, and after referring to the support which Jenner received from Woodville and Pearson (and wrongly describing Pearson as a physician to the Smallpox Hospital in London), he says that :—

“the systematic observations of many qualified observers have long since turned the tide in favour of the upholders of the practice as a scientific and prophylactic measure, and it is unnecessary now to draw attention to the convincing figures which have proved its value. It is sufficient to state that, from a long study of the pock diseases of animals, especially vaccinia or cowpox, and from experiments and observations made by scientists, the relationship of variola and vaccinia has now been established on a firm basis of fact.”

This highly questionable dictum is put forward on the strength of certain experiments which have shewn that it is possible to inoculate a calf with smallpox material, and to obtain a vesicle similar in appearance to that obtained by the use of “vaccine material.”

Dr. Hanna must surely be aware (a) that neither the germ of smallpox nor that of vaccinia has yet been discovered, and (b) that it is possible to produce the characteristic “vaccine vesicle” on a calf with almost any variety of “pox” virus—simple facts which completely shatter the scientific pretensions of cowpoxing as a protection against smallpox.

A brief allusion to the risk of the introduction of smallpox into this country from abroad, and to the gradual accumulation of susceptible material in the shape of the increase of unvaccinated children, and of older persons whose vaccinal “protection” has been lost as years pass, brings Dr. Hanna to the Liverpool Epidemic of 1902-3. This epidemic provided the major part of the cases which form the subject of his “Studies.”

### DR. HANNA'S SELECTION OF CASES.

Dr. Hanna states that all the cases which occurred during the epidemic were not available for the purposes of his investigation, “owing to the fact that the method of recording the required particulars was not at first adopted.”

It is unfortunate, to say the least, that the method referred to by Dr. Hanna was not adopted for all the cases, particularly in view of the fact that Dr. Hope's report on the epidemic classifies all the cases, as regards severity, into vaccinated, unvaccinated, and doubtful classes, respectively, and a comparison of Dr. Hope's method of classification with that adopted by Dr. Hanna, shows that Dr. Hanna's selection of cases discriminates unfairly against the unvaccinated. This will be apparent on a comparison of the following tables :—

## DR. HOPE'S FIGURES.

	Vaccinated.		Unvaccinated.		Doubtful.		Total.	
	No.	Per cent. of Total.	No.	Per cent. of Total.	No.	Per cent. of Total.	No.	Per cent. of Total.
Mild	1219	74.6	88	30.2	57	42.2	1364	66.2
% of total	89.3	—	6.5	—	4.2	—	—	—
Severe	365	22.3	131	45.0	49	36.3	545	26.5
% of total	67.0	—	24.0	—	9.0	—	—	—
Fatal	50	3.06	72	24.8	29	21.5	151	7.3
% of total	33.1	—	47.7	—	19.2	—	—	—
Total	1634	—	291	—	135	—	2060	—
% of total	79.3	—	14.1	—	6.6	—	—	—

Dr. Hope's Report also includes certain subsidiary tables giving particulars of 40 cases (one fatal) which were said to have been re-vaccinated prior to exposure, and eight cases who had previously had smallpox. No mention of these cases appears anywhere in Dr. Hanna's book.

## DR. HANNA'S FIGURES.

	Vaccinated.		Unvaccinated.		Doubtful.		Total.	
	No.	Percent. of Total.	No.	Percent. of Total.	No.	Percent. of Total.	No.	Percent. of Total.
Mild	686	72.7	37	16.8	No Statement.		723	62.1
% of total	94.9	—	5.1	—			—	—
Severe	229	24.4	123	56.0			352	30.3
% of total	65.0	—	35.0	—			—	—
Fatal	28	2.9	60	27.2			88	7.6
% of total	31.8	—	68.2	—			—	—
Total	943	—	220	—			1163	—
% of total	81.0	—	19.0	—			—	—

It will be seen that while Dr. Hope allotted 24.0 and 47.7 per cent. of his cases to the "unvaccinated" class as severe and fatal, respectively, Dr. Hanna's selection increased these percentages to 35.0 and 68.2, respectively—an increase of nearly 50 per cent. in each case.

Further reference will be made to Dr. Hanna's omission of "doubtful" cases, which, as will be seen from Dr. Hope's figures, constitute an important factor. Their importance will be apparent on an examination of the following table, which shows the effect of the addition of the "doubtful" class to the "vaccinated" class :—



## DR. HOPE'S FIGURES.

	Vaccinated.		Vaccinated and Doubtful.	
	No.	Per cent. of Total.	No.	Per cent. of Total.
Mild .. ..	1219	74.6	1276	72.1
% of total ..	89.3	—	93.5	—
Severe .. ..	365	22.3	414	23.4
% of total ..	67.0	—	76.0	—
Fatal .. ..	50	3.06	79	4.5
% of total ..	33.1	—	52.3	—
Total .. ..	1634	—	1769	—
% of total ..	79.3	—	85.9	—

It will be noted that the effect of adding the "doubtful" cases to the "vaccinated" class is to increase the fatality-rate in that class from 3.06 to 4.5—an increase of nearly 50 per cent. The significance of this increase will be apparent when it is pointed out that in the Leicester outbreaks of 1903-4 the fatality-rate amongst the "unvaccinated" alone was only 4.9 per cent., and amongst the "vaccinated" and "unvaccinated" combined only 3.5 per cent. ! (See Table VII., p. 17.)

## PART I.

Part I. of Dr. Hanna's book, is entitled "A Statistical Study of 1,163 cases of smallpox, with special reference to Vaccination in modifying the disease."

"New methods" are said to have been adopted in recording and comparing this series of cases. It is pointed out that the attention of previous investigators of the question of scar-area "was only directed to counting the number of vaccination scars, estimating their quality, or approximating their area" (p. 11). Dr. Hanna states, however, that in his 943 vaccinated cases the scar-area has been accurately measured in each case. A note was also taken of the severity of, and the mortality from, the disease at different age-periods.

Dr. Hanna's "New methods" and their results may be impeached on several grounds:—

His display of pseudo-scientific precision in the measurement of scar-areas is stultified by the fact that he cannot produce a tittle of scientific proof that there is any relationship between extent of scarring, and efficiency of vaccination. In the absence of any knowledge of the presence of the undiscovered vaccine germ in any given sample of "lymph," it is plain also that there can be no proof that the scars produced are vaccine scars, typical or otherwise, or that their size bears any relationship to the germ-content of the "lymph" used. In fact, such evidence as is available tends to show that large marks are produced by "extraneous germs."

This has been frankly admitted by Dr. S. Monckton Copeman, the greatest vaccine expert in this country. In a paper on "Modern Methods of Vaccination," published in the "Lancet" on the 21st December, 1902, Dr. Copeman says :—

"When every care has been taken to protect the arm during the progress of the vaccination, and to prevent the premature detachment of the crusts, the amount of permanent scarring of the skin which remains may be astonishingly slight. This is, I think, one of the results of modern methods of vaccination to which, as yet, attention has hardly been sufficiently directed, although in the future it is likely to prove a matter of considerable importance. There can be little doubt but, that the huge and deep scars, which not infrequently resulted from the vaccinations of former years, were due, to some extent, to excessive destruction of skin-tissue by micro-organisms other than that specific to vaccinia. If this be so, then it becomes apparent that persistence of such large and deep scars, practically throughout life, does not necessarily afford evidence that any equivalent degree of immunity against the infection of smallpox is enjoyed by their possessor."

The like conclusion was emphasised by the "Lancet" Lymph Commissioners in 1900 and 1902. In an editorial on the first report of their Commissioners, the "Lancet" said (April 28th, 1900) :—

"There is reason to believe that the immunity conferred by vaccination is just as marked when the local effects practically stop short at the characteristic vesiculation."

It is interesting to note that the editor of the "Lancet," in an editorial upon Dr. Hanna's book, which appeared on the 3rd May, 1913, has apparently forgotten his previous pronouncement, or he would surely not have stated that :—

"There can be no doubt of the fact that the Liverpool experience bears out the statement that the scar-area of vaccination has an important relation to the severity of smallpox; the larger the area the milder the character of the disease."

The fallaciousness of Dr. Hanna's new "Marks Theory" is also obvious from a consideration of analagous processes. One bite of a poisonous snake is as effective as twenty. The slightest scratch sufficed sometimes in the old days of smallpox inoculation to give a mild attack of that disease. No importance whatever is attached to the production of "marks" in any other form of vaccine prophylaxy. Why should Jennerian vaccination be the only exception to this general rule? If the virtue of vaccination consists in the constitutional effects produced by the self-multiplying power of a "germ," it is plain that these effects may be produced as effectively by one vesicle as by four or more. Jenner insisted that the operation could be "duly and efficiently" performed by means of one mark, and that one operation was sufficient to afford life-long protection. His "triumphs" were all achieved with one-mark vaccination. In America one vesicle is the rule, or if two vesicles are produced, the second is only inflicted in case the first fails. The German Vaccination Commission in 1884 ("consisting of eighteen experts in the subject, all of them medical men"—Dr. Edwardes), concluded that "at least two well-developed vaccine

vesicles are necessary to ensure an efficient protection." In June, 1899, the German Bundesrath reduced this standard to this extent, that : " At least one well-developed vaccination is necessary to obtain sufficient vaccination protection."

### SCAR-AREA VARIES WITH AGE.

Dr. Hanna supplies some very curious information, never before recorded, in regard to the actual growth of vaccination scars, showing that they get larger as age advances until the 20-30 year age-period is reached, and then gradually become smaller. He thinks the increase is due to stretching the scar tissue on growth of the body, and the decrease to atrophy of the scar tissue as age advances. This suggestion was made, he adds, by his colleague, Dr. Stallybrass. With all respect to these experts we venture to mention another at least contributory explanation, viz. : that the larger marks of middle life are due to the more drastic methods of vaccination that prevailed 30-40 years ago, the smaller marks of the older periods to the Jennerian one-mark vaccination, and the still smaller marks of the modern periods to the fact that vaccination is now carried out in such a way as to produce scarcely any vesiculation at all.

The following is a summary of the figures given by Dr. Hanna : Col. (1) shows the average scar-area of the 943 vaccinated cases of smallpox that his book deals with, and Col. (2) shows the average scar-area of 368 vaccinated persons taken from amongst the general population who have not had smallpox. These 368 persons comprised children found in some of the infectious-disease hospitals, together with a series of adult cases obtained in the Liverpool Workhouse.

### SCAR-AREA (1) AMONGST VACCINATED CASES OF SMALLPOX, AND (2) AMONGST VACCINATED POPULATION.

Age-period.	Average Scar-area in square inches.	
	(1) No Cases.	(2)
Under two years.		.25
2-5 .....	.25	.35
5-10 .....	.43	.53
10-15 .....	.51	.69
15-20 .....	.58	.96
20-30 .....	.93	1.1
30-40 .....	.73	.98
40-50 .....	.45	.80
50-60 .....	.41	.67
60 and up .....	.32	.47



Dr. Hanna also inserts a diagram giving curves of the figures shown in Cols. (1) and (2) above, and points out "that the curve formed by the average vaccination scar-area of the general population is a higher one at all age-periods than that obtained from those who have been attacked by smallpox."

### DR. HANNA'S "UNKIND CUT."

An exceedingly important result is displayed in Dr. Hanna's scar-area table for the general population, which has apparently escaped his attention, otherwise he would not have given it such prominence.

The "Instructions to Vaccinators," issued to Public Vaccinators by the Local Government Board, state that "the total area of vesiculation resulting from the vaccination should not be less than half a square inch." According to this standard, therefore, Dr. Hanna's figures show that the Liverpool child population under two years is inefficiently vaccinated to the extent of .25 of a square inch (i.e., one-half) less than the minimum standard of the Local Government Board, and those in the next age-period of 2-5 to the extent of .15 of a square inch.

This fact also brings to light the grotesque trickery of the "marks theory." Large marks are postulated as being theoretically necessary for protection against smallpox. At the same time few, if any, children are vaccinated (according to Dr. Hanna's figures) even up to the Government's minimum standard. Hence no "properly protected" children can possibly take smallpox. There are none to take it.

### HIS STATISTICS ARE UNTRUSTWORTHY.

Apart from the scientific fallaciousness of mark measurements, it is equally demonstrable that Dr. Hanna's statistics are untrustworthy from other standpoints—they involve too much scope for error and bias in the observer. For example, Dr. Hanna's tables, I. and II., and the Chart A based thereon, show that there were no vaccinated cases in the 0-2 age period, and only seven cases, with no deaths, in the 2-5 period. Dr. Hope's special report on the epidemic, however, brings to light the awkward fact that **Dr. Hanna has omitted 4 cases and 2 deaths under one year, and 13 cases and 2 deaths in the 1-5 period as to which the vaccinal condition was in doubt** (This doubt, by the way, could have been easily cleared up by a reference to the vaccination registers, had there been any strong desire to clear it up).

The following summary illustrates the effect of this omission:—



# DR. HOPE'S TABLES.—2060 Cases and 151 Deaths.

Age-Period.	Vaccinated.		Unsuccessfully Vaccinated.		Vaccination Doubtful.		No Statement.		Unvaccinated.		Total.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
0-1 ..	0	0	2	0	0	0	2	2	48	25	52	27
1-5 ..	7	0	3	0	3	2	7	0	54	17	74	19
5-15 ..	180	0	15	0	10	0	7	0	86	7	298	7
15-30 ..	745	8	7	1	17	3	5	0	72	10	849	23
30- ..	702	42	18	6	38	14	1	1	31	13	787	75
Total ..	1,634	50	45	7	68	19	22	3	291	72	2,060	151
% of total ..	79.3	33.1	2.2	4.6	3.3	12.6	1.1	2.0	14.1	47.7	73.6	7.3
Fatality Rate ..	3.06		15.5		27.9		13.6		24.7			

# DR. HANNA'S TABLES.—1163 Cases and 38 Deaths.

Age-Period.	Vaccinated.		Unsuccessfully Vaccinated.		Vaccination Doubtful.		No Statement.		Unvaccinated.		Total.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
0-2 ..	—	—	No Statement.		No Statement.		No Statement.		29	17	29	17
2-5 ..	7	0							8	8	33	8
5-10 ..	34	0	No Statement.		No Statement.		No Statement.		26	5	60	5
10-15 ..	62	0							31	1	93	1
15-20 ..	103	0	No Statement.		No Statement.		No Statement.		30	4	133	4
20-30 ..	333	3							42	6	375	9
30-40 ..	248	13	No Statement.		No Statement.		No Statement.		14	8	262	21
40-50 ..	101	9							10	5	111	14
50-60 ..	35	1	No Statement.		No Statement.		No Statement.		10	5	45	6
60- ..	20	2							2	1	22	3
Total ..	943	28							220	60	1,163	88
% of total ..	81.0	31.8							19.0	68.2		
Fatality Rate ..	2.9								27.2		7.6	

## DR. HANNA'S TABLES I. AND II. AND CHART A.

Dr. Hanna's Table I. shows the number, and Table II. the percentages, of smallpox cases (943 vaccinated and 220 unvaccinated) at each age-period with relative degrees of severity; and his Chart A displays the percentages of Table II. in diagram form. It is significant that Dr. Hanna has selected the percentages of Table II., instead of the actual figures of Table I., as the basis for his Chart A. Anyone who cares to prepare a similar Chart, based on Table I., will be surprised to see what a different effect is produced.

But even as a percentage diagram it is grossly misleading. To be fair, all the age-periods should have been equal in duration. Instead of being so the first decennial period is split up into three periods (0-2, 2-5, and 5-10), and the second into two periods (10-15 and 15-20), all the remaining periods, except the last (60 and upwards) being decennial. The effect of this sub-division is to show *five* spaces on the diagram where two only should appear. This unfairly increases the "black" colouring of the death percentages in the first five columns, on the "unvaccinated" portion of the chart, over 100 per cent., and also increases the "mild" spaces in the "vaccinated" portion of the chart in a corresponding degree.

There is only one redeeming feature about the diagram, and that is the boomerang-like fashion in which it brings to light the "resistance of youth," and the influence of "natural immunity," to smallpox. The enormous drop in the "black" space in the 10-15 column of the "unvaccinated" side of the diagram must immediately attract the attention of even the most casual observer. The measure of this drop is the measure of the absurdity of the contention that the huge "black" area of the "unvaccinated" half of the diagram is attributable to neglect of vaccination. Dr. Hanna's diagram is, in fact, an unintended demonstration not of the value of vaccination but of the value of youthful vigour and natural immunity. As young infants and weakly persons generally escape vaccination, it follows that such persons are excluded from Dr. Hanna's "vaccinated" class, and that they doubtless make up a very large proportion of his "unvaccinated" class. Naturally, therefore, the former class shows a preponderance of "mild" cases and the latter a preponderance of fatal cases. In his anxiety to make out an overwhelming case for vaccination, Dr. Hanna is "hoist with his own petard."

## THE CONCLUSIONS DRAWN FROM DR. HANNA'S STATISTICS ARE IRRATIONAL.

Even if Dr. Hanna's mark measurements, and tables, were as scientific and trustworthy as they have been shewn to be unscientific

and untrustworthy, it would still be possible to demonstrate that the conclusions which he has based upon them are irrational.

This will be apparent from a study of the following percentages showing the case-mortality of the "vaccinated" and "unvaccinated," respectively, at each age-period. The figures on which these percentages are based are those shown on the table headed "Dr. Hanna's Tables," as quoted above (p. 25):—

### DR. HANNA'S 1,163 CASES AND 88 DEATHS.

#### Case-Mortality Percentage.

Age-Period.	Vaccinated	Unvaccinated.	Total.
0-2	—	58.0	58.0
2-5	—	30.6	24.2
5-10	—	19.0	8.3
10-15	—	3.2	1.0
15-20	—	13.3	3.0
20-30	.9	14.2	2.4
30-40	5.2	33.3	8.0
40-50	8.9	50.0	12.6
50-60	2.8	50.0	13.3
60—	10.0	50.0	13.6
All Ages	2.9	27.2	7.6

The teaching of these figures seems to be overwhelmingly in favour of vaccination. A very little study of them will suffice to show that that conclusion is not sound.

The decline in the case-mortality of the unvaccinated from 58.0 per cent. at the 0-2 age-period to 3.2 at the 10-15 age-period, proves at once that some weighty factors must enter into the question of case-mortality, apart altogether from "vaccination." The figures show that the very young children and the very old people displayed a greater liability to fatal smallpox, than those between 10 and 30 years of age.

Dr. Hanna admits this in his letterpress, when he says that:—

"this decrease (from 58.0 to 3.2 per cent.) may be attributed to the gradual development of the natural resistance, and recuperative power of youth, enabling the patient to recover from the disease; this may be compared with what is observed in other infectious diseases." (P. 15).

It may also be better compared with what is observed in the general death-rate, as follows:—

## CITY OF LIVERPOOL.

## Age-incidence of Deaths :—

(a) from all causes, 1902-3.

(b) from smallpox, 1902-3.

Age-Period.	(a)		(b)
	1902	1903	
0-1	25.3	25.6	17.9
1-5	15.7	13.2	12.5
5-15	5.1	3.9	4.7
15-30	6.9	7.2	15.2
30-	47.0	50.0	49.7

This simple table proves conclusively that liability to death from smallpox is dominated not by vaccination, but by practically the same factors which dominate death from all causes. The table also confirms the conclusion, which can be readily demonstrated by other figures, that smallpox is usually contracted only by those whose health is enfeebled, that those who recover from it usually enjoy better health than they had previous to the attack, and that it is only fatal in those cases where the system is too weak from inter-current disease to bear the cleansing efforts of the smallpox fever.

In his endeavour to justify the large per cent. (27.2) of deaths amongst his "unvaccinated" cases, Dr. Hanna says :—

"Dr. Woodward, dealing with the last twenty-five years of the eighteenth century, when all patients were unvaccinated, states that the death-rate was 32 per cent. of the admissions to the Smallpox Hospital."

Dr. Hanna omits to state, however, that this percentage related to London only, and that at that period only the worst and most impoverished cases were removed to Hospital. As an indication of the case-mortality in the country generally, the percentage in question grossly overstates the figures given by trustworthy authorities.

There is no question that the general case-mortality now is about the same as it was in the last century (viz. : from about 13 to 17 per cent.). Proof of this statement will be found in Dr. Edwardes's "Smallpox and Vaccination in Europe," p. 21, and in the Royal Commissioners Minority Report, Clauses 93 to 99.

It does not speak much for Dr. Hanna's knowledge of the subject that he should be unaware of the existence of the figures quoted by these authorities.

### THE "VACCINATED" AND "UNVACCINATED" CLASSES ARE NOT EQUAL IN OTHER RESPECTS.

Dr. Hanna's conclusions from his tables are also grossly irrational because his two classes of "vaccinated" and "unvaccinated"



differ enormously in other respects, apart from their vaccinal condition.

Ever since the introduction of vaccination, the population of Liverpool has always been exceedingly well-vaccinated, probably the best-vaccinated in the United Kingdom. Even Dr. Hope's figures for the 1902-3 epidemic show that no less than 79.3 per cent. of the cases had been duly "protected!" It follows, therefore, that the "unvaccinated" section of the community would be almost entirely made up of newly-born infants too young to be vaccinated, and infants and children of all ages too weakly to be vaccinated. To regard the smallpox mortality of these classes as being merely due to the absence of vaccination is obviously a statistical trick.

Conclusive proof of the reasonableness of this view is afforded by the following comparison of the Liverpool experience with that of Leicester in the same epidemic. The great significance of this comparison lies in the fact that the child population of Leicester is almost entirely unvaccinated. If, therefore, absence of vaccination is the prime factor in determining the incidence of smallpox,\* Leicester's unvaccinated children ought to have suffered from the disease with a severity at least equal to that of the unvaccinated children of Liverpool. The following striking table in respect of the cases which occurred in Leicester in 1903, shows that they suffered far less:—

#### LEICESTER SMALLPOX EPIDEMIC, 1903.

Age-Period.	Vaccinated.			Unvaccinated.		
	Cases.	Deaths.	Case Mortality per cent.	Cases.	Deaths.	Case Mortality per cent.
0-1	—	—	—	4	2	50.0
1-5	—	—	—	29	2	7.0
5-10	—	—	—	58	4	7.0
10-15	2	—	—	43	2	4.6
15-20	9	—	—	40	2	5.0
20-30	60	—	—	14	1	7.0
30-40	66	—	—	6	1	16.6
40-50	38	3	8.0	4	2	50.0
50-60	11	—	—	—	—	—
60 and up	8	1	12.5	—	—	—
Total	194	4	2.0	198	16	8.0

In addition to the above cases, there were two "uncertain" cases, one of whom died.

\* The freedom of a community from smallpox is associated with the extent and efficiency with which vaccination has been practised. Those who are efficiently vaccinated are as safe as the hospital nurses. It is only those who are imperfectly protected who are liable to contract the disease at all."—

Dr. E. W. HOPE (M.O.H.), Liverpool. Report on the Liverpool Outbreak of Smallpox, 1902-3. P. 4.

Even more striking results are displayed by the following figures in respect of the further outbreak, which took place in Leicester in 1904 :—

### LEICESTER SMALLPOX EPIDEMIC, 1904.

Age-Period.	Vaccinated.			Unvaccinated.		
	Cases.	Deaths.	Case Mortality per cent.	Cases.	Deaths.	Case Mortality per cent.
0-1	—	—	—	6	1	16.6
1-5	—	—	—	23	—	—
5-10	—	—	—	43	2	4.7
10-15	—	—	—	53	—	—
15-20	4	—	—	41	—	—
20-30	34	—	—	19	—	—
30-40	49	—	—	5	—	—
40-50	26	1	4.0	1	—	—
50-60	9	—	—	—	—	—
60 and up	5	—	—	1	—	—
Total	127	1	.8	192	3	1.5

In addition to the above cases there were two “uncertain” cases.

It only remains to ask Dr. Hanna to explain why lack of vaccination in Liverpool produced a case mortality of 27.2 per cent. in the “unvaccinated,” while a far greater lack of vaccination in Leicester produced a case-mortality of only 8.0 per cent. in 1903 and 1.5 per cent. in 1904 ?

The same striking advantage in favour of unvaccinated Leicester is well-displayed by the following comparison of the total cases and deaths :—

Epidemic.	Cases.	Deaths.	Case Mortality per cent.	Per cent. of Cases Vaccinated.*
Liverpool, 1902-3	2060	151	7.3	79.3
Leicester, 1903	394	21	5.4	50.0
„ 1904	321	4	1.24	40.0

\* This is the percentage of the cases which were admitted, by the doctors in the smallpox hospitals, to have been vaccinated.

It is submitted that these figures are alone sufficient to shatter the whole of the argument deduced from Dr. Hanna's Tables I. and II., and his Chart A framed thereon, **because they prove that it was far safer, from the point of view of liability to death from smallpox, to be attacked in badly-vaccinated Leicester than in well-vaccinated Liverpool.**

### “NATURAL IMMUNITY.”

On page 20 of his book Dr. Hanna says that “the effect of vaccination is to re-inforce the natural immunity of the body.”

He is bound to admit the presence of "natural immunity," because his hospital statistics show that there were "mild" cases even amongst the "unvaccinated." He fails to see, however, that the occurrence of these mild cases proves at least that the severe and fatal cases may not have been severe and fatal because of the lack of vaccination, but because of the lack of "natural immunity." It is impossible to prove that vaccination has ever "re-inforced" the "natural immunity" of a single person, because there are no means of assessing the extent of the "natural immunity" of any such person. Plenty of unvaccinated people have been exposed to smallpox in Leicester and other places during recent years without contracting the disease, and, as their natural immunity sufficed to protect them, it is reasonable to believe that those vaccinated people who escape attack do so solely because of their natural immunity. These simple considerations entirely dispose of the further arguments in Part I. of Dr. Hanna's book as to "the influence of vaccination on the eruption and on the severity of the disease," and also Part II. of his book which consists of "an analysis of 943 cases of smallpox (with primary vaccination) in relation to scar-area and severity of disease." It is not necessary, therefore, to examine the arguments of those portions of the book in further detail. The experience of Leicester, as compared with Liverpool, smallpox cases (taken as a whole and without subjecting them to specious classification), demonstrates that the only influence exerted by vaccination is to diminish, instead of reinforce, the "natural immunity" of the body.

Notwithstanding Dr. Hanna's admissions as to the protection afforded by "the natural resistance and recuperative power of youth" on pages 15, 17 and 19, and his statement on page 20 that "the effect of vaccination is to reinforce the natural immunity of the body," he refers on p. 49 to his Chart A as showing a 50 (? 58) per cent. mortality amongst unvaccinated children as "a result of the neglect" of vaccination, and in reciting his "conclusions" on p. 51 he says "that the case-mortality in the natural disease—i.e., in the unvaccinated, which ranges from approximately 25 to 40 per cent., has been reduced by the power of vaccination to about 3 per cent. in those who have been well vaccinated."

If Dr. Hanna did not wish to mislead the reader, it only remains to ask him how he reconciles these unqualified statements as to the "protection" of vaccination, with his earlier admissions as to the part played by natural resistance and natural immunity.

#### **"DE-VACCINATION."**

A brief reference may be made to certain damaging admissions made by Dr. Hanna under the heading "De-Vaccination." He says that "the highest resistance lasts only a short time," and that "following a primary vaccination in infancy, the



period of greatest protection in childhood probably does not cover more than three to five years, and after this, the absolutely preventive efficiency of vaccination rapidly diminishes, and cases of smallpox begin to appear amongst the vaccinated." Dr. Hanna seems blind to the fact that admissions of this kind virtually give up the whole case for vaccination, because they prove that only the merest fraction of the population have been at any time really "protected," and that the alleged triumphs of vaccination are really triumphs of "de-vaccination."

### PART III.

If the period of greatest protection in childhood does not cover more than three to five years, it is safe to assume that the "protection" lapses altogether by the age of 20, and that after that age the "vaccinated" become virtually on a level with the "unvaccinated." In that case it is interesting to compare the experience of these two classes, according to Dr. Hanna's figures:—

#### CASES AND DEATHS ABOVE 20 YEARS OF AGE.

	Cases.	Deaths.	Fatality Rate per cent.
"De-Vaccinated" ...	737	28	3.8
Unvaccinated ...	108	29	26.8

These figures show that the alleged unvaccinated died at seven times the rate of the virtually unvaccinated. It is once more obvious that the "unvaccinated" must differ enormously in character from the "vaccinated."

### CONCURRENT VARIOLA AND VACCINIA.

In Part III. of Dr. Hanna's book an attempt is made to demonstrate that vaccination has a beneficial effect upon smallpox, even when the operation is performed after smallpox has been contracted, especially if the vaccination be done in the first few days of the incubation period. The cases upon which Dr. Hanna bases his demonstration are obviously selected, and in the absence of any information as to the method of selection, we take leave to doubt the validity of the beautifully symmetrical conclusions which Dr. Hanna draws from his selected cases. They are really too perfect to be true, having regard to the variety and complexity of the factors affecting the problem in hand.

Justification of these criticisms is afforded by the following considerations:—

Dr. Hope's Report on the 1902-3 outbreak shows that there were 88 cases of concurrent vaccination and smallpox, 15 of which were fatal, and 182 cases of concurrent re-vaccination and smallpox, 4 of which were fatal.



Dr. Hanna's Chart B shows only 30 cases of concurrent vaccination and smallpox, three of which were fatal, and his Chart C only 45 cases of concurrent re-vaccination and smallpox, none of which was fatal. **He has omitted 58 cases and 12 deaths of the first variety, and 137 cases and 4 deaths of the second variety. Why?**

On p. 14 of his book Dr. Hanna quotes twenty cases of concurrent variola and vaccination, recorded by Dr. Birdwood, of the Metropolitan Asylums Board, and published in 1878 in a report of the Clinical Society of London. He appears not to have noted the far more extensive and up-to-date series of cases collected by Dr. Freer and referred to by Dr. Ricketts, Medical Superintendent of the Smallpox Hospitals of the Metropolitan Asylums Board, on pp. 144-5 of his book on "The Diagnosis of Smallpox" (Cassell & Co., Ltd., 1908), also Dr. Ricketts' conclusions on the subject of "Vaccination after Exposure." This is rather unfortunate for Dr. Hanna, seeing that Dr. Freer's cases, and Dr. Ricketts' conclusions, altogether upset the results of Dr. Hanna's "studies" on the same point.

Dr. Hanna's investigations led him to infer :—

"that vaccinations performed within the first three days of infection in persons with a primary vaccination will not develop smallpox, and in those who are unvaccinated the chances are that the disease will not develop; or, in other words, vaccination requires nine days to develop an immunity which will absolutely prevent or minimise an attack of smallpox."

Dr. Ricketts' investigations, on the other hand, led him to adopt the following conclusions :—

"Vaccination done within a day or two after exposure and followed by a normal re-action, is a certain preventive. If postponed until the latter part of the period of incubation, it will be ineffectual.

The duration of the period of incubation, counting to the outcrop of the rash, may be taken as fourteen days. If this period be divided into three intervals comprising seven days, three days and four days, then it will be accurate, in the main, to say that a successful vaccination done in the first interval will wholly prevent the attack, done in the second will have more or less effect in modifying the eruption, and done in the last will merely add to the patient's troubles." (P. 144).

The following table shows how Dr. Hanna's cases look when classified according to Dr. Ricketts' three periods :—

**Dr. Hanna's cases classified according to Dr. Ricketts' Period I., during which successful vaccination should wholly prevent attack; Period II. during which the eruption will be modified; and Period III. during which the "remedy" adds to the patient's troubles.**

	Period I.		Period II.		Period III.	
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
Chart B Cases	13	—	5	—	12	3
Chart C Cases	19	—	4	—	22	—

This simple table reduces Dr. Hanna's conclusions to an absurdity, because, according to Dr. Ricketts' standard, the 32 cases in Period I. ought not to have contracted smallpox at all! It also shows that the Liverpool hospital doctors inflicted vaccination upon at least 34 cases (and probably many more), three of which were fatal, in Period III., at which time the operation merely "added to the patient's troubles," and probably contributed, in some of the cases, to fatal results.

It is thinkable that Dr. Hanna may be right in his conclusions and Dr. Ricketts wrong. It is more probable, however, that both are wrong. In any case we have them at loggerheads, to settle their differences between them.

We are confirmed in the view that probably both are wrong by a consideration of a Chart (compiled from the M.A.B. hospital records by Dr. R. M. Freer, a former colleague of Dr. Ricketts), which Dr. Ricketts reproduces in his book (p. 146) "to show how immunity to vaccinia is acquired coincidently with the onset of an attack of smallpox." Dr. Freer's chart is based on the records of "a large number of patients [1,157] who suffered from smallpox, and had been vaccinated either during the period of incubation or during the first few days of the illness." [NOTE.—The "onset" of an attack of smallpox, and the period of "illness," set in after the 11th day of the incubation period.]

The chart shows that among 464 patients who were vaccinated during the first eight days of the period of incubation, the successful results approached closely to 100 per cent. It also shows that the susceptibility to the operation gradually declined from that period, and that out of 255 cases vaccinated after the rash had developed, about one-fifth, or 20 per cent. only, were successful.

In reproducing Dr. Freer's chart, Dr. Ricketts does not appear to have noticed that the uniform success which Dr. Freer had with his 464 vaccinations during the first eight days of the period of incubation altogether stultifies his own statement on p. 144 of his book, that a successful vaccination done in the first seven days of the incubation period will, in the main, wholly prevent an attack of smallpox.

Incidentally, it may be further pointed out that Dr. Freer's success in vaccinating about 50 cases, **after the rash had developed**, also makes nonsense of Dr. Hanna's contention, that it is not possible for a successful vaccination to take place after the appearance of the eruption.

It is impossible for us to say which of these "experts" is right and which is wrong. We merely pillory their absurd contradictions to show that probably all three are wrong, and that in any case their tables, charts, and conclusions, are altogether untrustworthy.

Although the vaccinations after the "onset" of the disease are usually unsuccessful, Dr. Hanna says, "it must not be understood that the modified organisms implanted in the system did not

exercise any appreciable effect." He then quotes a case in illustration of this point in which a lady, who was vaccinated one day after the appearance of the rash, displayed certain surprising modifications of the normal course of the disease, which, Dr. Hanna considers, gave "convincing proof of the value of vaccination done subsequently to onset of symptoms." He also adds. "**The operation ought, therefore, to be performed on all cases admitted to hospital.**" And this notwithstanding Dr. Ricketts' opinion that vaccination in the period of "onset" and after the rash appears, "will merely add to the patient's troubles."

Dr. Hanna endeavours to explain the alleged modifying effect of vaccination after smallpox has been contracted, as follows:—

"The remarkable antagonism of these two diseases can only be explained by a consideration of the question of immunity or concurrent immunities. It may suffice to say that in smallpox, with a concurrent vaccination, it is a race between the virulent and the modified organisms; the less virulent and the more saprophytic forms grow faster and produce immunity more quickly than the more virulent ones."

"Remarkable antagonism" is rich, seeing that all the cases up to the "onset" show a successful vaccination, and, therefore, no "antagonism" at all. Even Dr. Hanna's cases merely show that the "antagonism" only begins after the "onset," and it is then an antagonism of the more virulent disease against the "modified organisms," in which the more virulent disease naturally proves a more or less easy victor.

Dr. Hanna's race between the virulent and the modified organisms, in which the less virulent race the faster, would form an appropriate theme for a comic cartoon.

If vaccinia and smallpox really are identical diseases, the former being a modified type of the latter, the only common sense conclusion to be drawn from the infliction of vaccination after real smallpox has been contracted is, that it merely adds fuel to the flames of the smallpox fever.

### PITY THE INFANTS.

The closing section of Part III. of Dr. Hanna's book deals with seven cases of concurrent vaccination and smallpox amongst infants, one of which was fatal. As, however, Dr. Hope shows, in his special report on the Epidemic, that there were no less than **23** such cases, **9 of which were fatal**, it is quite obvious that Dr. Hanna's seven cases are of a selected character. Moreover, in the particulars of the cases treated in the Priory Road Hospital in 1903, as given in Dr. Hope's Annual Report for that year (p. 237), it is stated that of the four fatal cases under five which occurred in that hospital, "three occurred in infants whose mothers had smallpox when they were born." Dr. Hanna's list includes five cases born in hospital, only one of which was fatal. If, however, three fatal cases occurred in one hospital, where only a compara-



tively small number of cases in the aggregate (173) were treated, it is very probable that a great number of fatal cases in infants born in hospital occurred in the other hospitals (viz. : Fazakerley and Park Hill), where the bulk of the cases were treated. In any case, it is plain that Dr. Hanna has revealed only a part of the facts.

A brief reference may be made to Dr. Hanna's remarks in regard to his Cases 1 and 2, which were born in the smallpox hospital. He says that these cases were "infected with smallpox on the day of birth and the day following, respectively," and that they were "vaccinated within twenty-four hours, with entire absence of development of any symptoms or signs of the disease; and the mothers continued to nurse these children until they were convalescent and discharged; in these cases the vaccinations were entirely successful and absolute protection was afforded."

It only remains to explode this absolute nonsense by a simple question: "If there was an **entire absence of development of any symptoms or signs of the disease**, how does he know that the babies had smallpox at all?"

We take leave to believe the "natural immunity" and vigour of these babies enabled them to resist the infection of smallpox, and at the same time pulled them through the cruel ordeal of vaccination immediately after birth. We also take leave to believe that if the nine fatal cases of infants vaccinated after exposure to smallpox, as mentioned in Dr. Hope's report, had not been vaccinated, some of them might have been living to-day.

## CONCLUSIONS.

It is submitted that the following conclusions may be drawn from these Studies:—

(1) The fact (shewn by Table II.) that during the last half century, typhus and smallpox have declined in Liverpool in almost the same ratio (viz. : 98.0 and 92.5 per cent., respectively) affords conclusive proof that the evolutionary source of smallpox is in no respect different from that of typhus; both diseases having been amenable to the same sanitary influences and preventive measures.

(2) Vaccination cannot possibly have played a beneficial part in the reduction of smallpox during the period in question, because it may reasonably be accepted that the operation was as extensively performed in the first decade of that period as it was in the last. The high percentages of the admittedly vaccinated cases, in the various epidemics referred to in Table IV., afford ample proof of this conclusion.

(3) Table V., showing the number of cases of smallpox in the 1902-3 epidemic in each of the wards or districts of the City, further proves that the incidence of the disease simply follows that of the zymotic class generally, and bears no relation whatever to the vaccinal condition of the population. The best vaccinated district



of the City (the Parish of Liverpool), instead of suffering the least, suffered the most.

(4) A comparison of the experience of Liverpool and Leicester during the 1902-3-4 epidemic, again establishes the uselessness of vaccination. The population of Leicester is as ill-vaccinated as that of Liverpool is well-vaccinated; and yet the disease there refused to "spread like wildfire," while the mitigating effect of **non-vaccination** in Leicester was 100 per cent. greater than the alleged mitigating effect of **vaccination** in Liverpool. In other words, the chances of escaping death from smallpox in the Leicester smallpox hospital, where only 45 per cent. of the cases were "protected" by vaccination, were two to one greater than the chances in the Liverpool hospitals, where no less than 80 per cent. of the cases had been duly "protected."

(5) Dr. Hanna's new method of measuring the protection of vaccination by the extent of the scar-area produced by the vaccine vesicles is unscientific, seeing that the "protective" virtue of vaccination must depend upon its constitutional effects, and these (like snake poisoning) may be produced as efficiently by a small mark as a large one.

(6) Dr. Hanna's measurements of the average scar-area existing amongst the general population of the City of Liverpool, show that the population under two years of age (and probably the child population of the country generally) is "inefficiently" vaccinated, to the extent of one-quarter of a square inch (i.e., to the extent of 50 per cent. of the Government standard of half-a-square inch), and that those in the next age-period of 2-5 are also "inefficiently" vaccinated to the extent of .15 of a square inch. These striking results show why "efficiently vaccinated" children rarely take smallpox. There are practically no such children.

(7) Dr. Hanna's tables and charts, and the conclusions based thereon, are untrustworthy, because they deal with a portion only of the cases and deaths occurring in the Liverpool 1902-3 epidemic, and omit some of the most important statistics, such as those relating to the infants and children whose vaccinal condition was said to be "doubtful."

(8) In any case, the conclusions drawn by Dr. Hanna from his figures are irrational, because the figures show that age produces enormous variations in the case-mortality of the unvaccinated. It is obviously absurd to suggest that unvaccinated infants (and in this connection it should be borne in mind that infants under six months of age are not required by law to be vaccinated) died at the rate of 58.0 per cent., or that the unvaccinated at all ages died at the rate of 27.2 per cent., **because they were unvaccinated**, seeing that **unvaccinated** children between the ages of 10-15 died at the rate of only 3.2 per cent., **almost as low a death-rate as that (2.9) of the vaccinated at all ages.**

(9) Dr. Hanna completely overlooks the fact, that his "vaccinated" and "unvaccinated" classes must differ enormously in other directions beside that of vaccination. As only healthy infants are allowed by law to be vaccinated, it follows that in a well-vaccinated community, like that of Liverpool, the "unvaccinated" section will be composed almost entirely of infants, children and others too weakly to be vaccinated. Under these circumstances it is a misleading use of statistics to assume that the "vaccinated" and "unvaccinated" classes vary only in respect to vaccination.

(10) The foregoing conclusion is confirmed by the experience of Leicester, where, notwithstanding that practically all the child population is unvaccinated, the case-mortality of the unvaccinated alone in the 1903 outbreak was only 8.0 per cent., and in the 1904 outbreak only 1.5 per cent. Taking the two outbreaks together, the case-mortality amongst the unvaccinated, was rather less than 5 per cent., as compared with Dr. Hanna's 27.3 per cent. amongst the unvaccinated, in Liverpool. It is plain from these figures that the "unvaccinated" in Liverpool must be a class very different from the "unvaccinated" in Leicester.

(11) Dr. Hanna's admission, that the greatest "protection" of primary vaccination lasts only a short time, and probably does not cover more than three to five years, after which it rapidly diminishes, destroys the whole case for vaccination, because it is tantamount to the admission that the vast majority of the community are now, and always have been, virtually "unprotected," and that the alleged triumphs of vaccination have been really triumphs of "de-vaccination."

(12) That the statistics offered by Dr. Hanna in proof of his contention that vaccination has a beneficial effect upon smallpox when the operation is performed after smallpox has been contracted, are altogether unscientific and illusory, and are flatly contradicted by the conclusions arrived at by other investigators. There are strong reasons for believing that vaccination at any stage after the incubation of smallpox has begun, merely "adds to the patient's troubles," and heightens the possibility of fatal results. **Hence the serious suggestion, that the operation ought to be performed on all cases admitted to hospital, is one that should not be acted upon by any doctor careful of the life of his patients.**

It is possible that some readers may consider that, while these various conclusions may be true of Liverpool's experience, they are not necessarily true of the general experience of smallpox, that the experience of one city is, in short, too small a basis on which to erect so great a structure of argument. Apart from the fact that Dr. Hanna considers the Liverpool experience adequate enough for the defence of vaccination, it will be found by all who care to further investigate the subject, that the experience of Liverpool in the matter of smallpox constitutes a replica of the larger national

experience of every country. No matter which country may be selected for investigation, the like conclusions follow, viz. :—that smallpox flourishes only in insanitary and overcrowded areas, that its diminution dates only from the adoption of effective sanitary measures coupled with the prompt notification and isolation of cases, and that in no case has its diminution displayed any tendency to be accelerated by vaccination.

A very careful study of the subject led the great scientist, Alfred Russel Wallace, to the conclusion that the operation not only did not prevent smallpox but really increased it. The grounds upon which he arrived at this startling conclusion are fully set forth in his little book, entitled : “ Vaccination a Delusion : Its Penal Enforcement a Crime,” which can be had from the National Anti-Vaccination League for 9d. a copy or 11d. by post. The following are the concluding paragraphs of this remarkable book :—

“ I venture to think that I have here so presented the best of these statistical facts [*i.e.*, the facts dealing with a century’s experience of smallpox] as to satisfy my readers of the certain and absolute *uselessness* of vaccination as a preventive of smallpox ; while these same facts render it in the highest degree probable that it has actually increased susceptibility to the disease. The teaching of the whole of the evidence is in one direction. Whether we examine the long-continued records of London mortality, or those of modern registration for England, Scotland, and Ireland ; whether we consider the ‘ control experiment ’ or crucial test afforded by unvaccinated Leicester, or the still more rigid test in the other direction, of the absolutely re-vaccinated Army and Navy, the conclusion is in every case the same : that vaccination is a gigantic delusion ; that it has never saved a single life ; but that it has been the cause of so much disease, so many deaths, such a vast amount of utterly needless and altogether undeserved suffering, that it will be classed by the coming generation among the greatest errors of an ignorant and prejudiced age, and its penal enforcement the foulest blot on the generally beneficent course of legislation during our century.

To talk of amending such legislation is a mockery. Absolute and immediate abolition is the only rational course open to us. Every day the vaccination laws remain in force parents are being punished, infants are being killed. An Act of a single clause will repeal these vile laws ; and I call upon every one of our legislators to consider their responsibilities as the guardians of the liberties of the English people, and to insist that this repeal be effected without a day’s unnecessary delay.

*The successive Vaccination Acts were passed by means of allegations which were wholly untrue and promises which have all been unfulfilled. They stand alone in modern legislation as a gross interference with personal liberty and the sanctity of the home ; while as an attempt to cheat outraged nature and to avoid a zymotic disease without getting rid of the foul conditions that produce or propagate it, the practice of vaccination is utterly opposed to the whole teaching of sanitary science, and is one of those terrible blunders which in their far-reaching evil consequences, are worse than the greatest of crimes.”*

